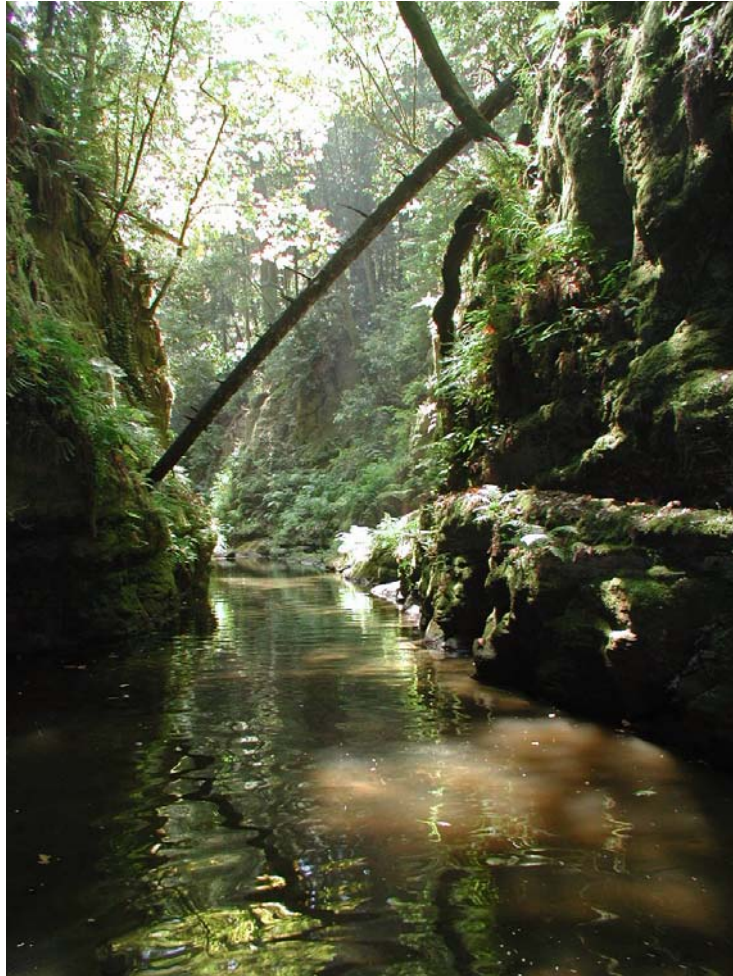


# Biotic Resources Group

Biotic Assessments ♦ Resource Management ♦ Permitting

## Aptos Creek Watershed Assessment and Enhancement Plan

### Riparian Vegetation Technical Report



*Prepared by*

Kathleen Lyons, Plant Ecologist

March 25, 2003

# APTOS CREEK WATERSHED ASSESSMENT AND ENHANCEMENT PLAN

## RIPARIAN VEGETATION

### 1.1 Introduction

The Aptos Creek Watershed is situated in the Aptos region of Santa Cruz County. The watershed supports both developed and undeveloped lands along three main watercourses: Aptos Creek, Valencia Creek and Trout Gulch. These watercourses, as well as their tributaries, support seven distinct riparian plant community types. This assemblage of riparian plant community types result from differences in a watercourse's topography and substrate, stream flow characteristics and current and past land uses.

The watercourses within the watershed are predominantly naturally-vegetated. Many parcels support residential land uses, including orchards and small farms. Some of the undeveloped lands in the upper watershed are also in timber production and a large portion of the watershed is contained within the Forest of Nisene Marks State Park. Overall, the watercourses within the Aptos Creek watershed afford considerable plant biodiversity.

Since the turn of the century, the planting of non-native trees and groundcovers has occurred along the stream courses within the watershed. The most notably non-native trees are blue gum eucalyptus (*Eucalyptus globulus*) and Monterey pine (*Pinus radiata*); the most prevalent non-native groundcovers are English ivy (*Hedera helix*) and periwinkle (*Vinca major*). In some areas, these species form dense groves, particularly in the lower and mid-portions of the watershed.

### 1.2 Methods

Kathleen Lyons, of Biotic Resources Group, conducted the resource analysis of the riparian vegetation within the watershed. Study methodology included literature review, aerial photograph interpretation, and field reconnaissance surveys.

Aerial photos of the project area were interpreted to ascertain the general type and distribution of riparian and in-stream wetlands within the watershed. The general extent of riparian and wetland vegetation, as demarcated by the dripline of woody vegetation or the edge of wetland vegetation, was drawn onto the aerial photos. Using 1"= 750' scale aerial photos (photos dated June 2000), polygons of primary habitat types were demarcated, wherever feasible. Polygons were drawn based on an aerial photo "signature", which in most instances, is the definition of a tree canopy along a watercourse. Habitat types were determined within approximately 100 feet of the centerline of Aptos Creek, Bridge Creek, Trout Gulch, Mangels Gulch and Valencia Creek, and their associated tributaries.

The aerial photo mapping was refined through field checking. Field surveys were conducted by the consulting plant ecologist during March, April, May, June, July and August 2002. Field surveys were conducted along portions of Aptos Creek, Bridge Creek, Trout Gulch, Mangels Gulch and Valencia Creek and their associated tributaries (where public access points were available). For portions of a watercourse that were inaccessible due to private property or other lack of access issues, the habitat features and other classification attributes were determined from aerial photo interpretation. Although every attempt was made to spot-field check each watercourse, there are some areas that were not field checked due to lack of site access. During the field surveys, the mapped polygons were refined as necessary to reflect the extent of the riparian vegetation. The edge of each polygon reflects the dripline of the riparian tree cover, as discernable at the mapping scale and from field observations.

The plant species composition within each polygon was documented as per *series* protocol of *Sawyer et al.* (e.g., redwood/alder riparian forest, redwood /tanoak riparian forest). Within each *series*, the vegetation characteristics

were documented by establishing a minimum of three *releve* sample plots within each *series*. A *releve* sample plot, measuring 50'x 50' was established with the creek center the mid-point of the plot. The following measurements were obtained at each sample plot: canopy cover (i.e., measurement of percent cover, by dominant plant species), average size class (diameter) and height of riparian trees, plant species composition (trees, shrubs and herbaceous plant species) and the occurrence of invasive, non-native plant species. Data from the sample plots was entered onto field data sheets, which are presented in Appendix A. The location of the sample plots is depicted on Figures 1.2-1 through 1.2-4.

In most instances, field checking was limited to public roads and access points in consideration of private property rights. Public lands were accessed to field check these areas. The *Jepson Manual* (Hickman, 1993) was the principal taxonomic references used for the botanical work. The habitat polygons were digitized into ArcView by specialists at Swanson Hydrology and Geomorphology; the riparian habitat distribution within the watershed is depicted on Figures 1.2-1 through 1.2-4.

Areas that may warrant special management were also identified during the field surveys. Areas containing large concentrations of invasive, non-native plant species were marked on the maps (see Figures 1.2-1 through 1.2-4).

The riparian areas within the watershed were evaluated for the known or potential occurrence for special status plant species. Plant species identified as occurring in the region, as documented in California Natural Diversity Data Base (CNDDB) "RareFind" (2002) and California Native Plant Society (CNPS) Rare Plant Electronic Inventory (2002), were searched for in the field. The occurrence and spatial distribution of special status species was obtained from previous data. No detailed rare plant surveys were conducted on the watershed lands as part of this study.

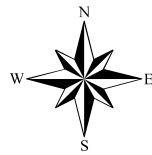
The information gathered from literature review, aerial photo interpretation and field reconnaissance surveys was used to describe the existing conditions of the botanical resources and present planning-level opportunities and constraints for resource management.

**Table 1.2-1. Riparian plant community types identified within the Aptos Creek Watershed**

Plant Series	Common Plant Species	Creeks where Documented	Sample Plots*
Redwood/Tanoak Riparian Forest	Redwood, tanoak, snowberry, western raspberry, thimbleberry, sword fern, chain fern, redwood sorrel	Trout Gulch Upper Valencia Creek Bridge Creek	UVC-1, 3, 4
Maple/Tanoak/Redwood Riparian Forest	Big leaf maple, tanoak, redwood, sword fern, lady fern, redwood sorrel, California blackberry, chain fern, thimbleberry, hazelnut	Valencia Creek Mangels Gulch Aptos Creek	VC-1, 2, 4 AC-4, 5
Alder/ Maple/ Redwood Riparian Forest	Red alder, big leaf maple, redwood, creek dogwood, stinging nettle, thimbleberry, hazelnut	Valencia Creek	VC-3, 5 AC-4
Alder/Box Elder Riparian Forest	Red alder, box elder, creek dogwood, yellow willow, lady fern, common horsetail, English ivy	Valencia Creek	VC-6, 7

## Legend

- Roads and Highways
- Streams
- Sample Plots



## Vegetation Communities

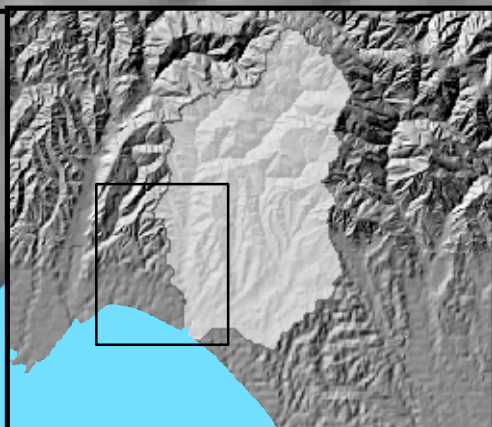
- 1 Alder/ Box Elder Riparian Forest
- 2 Alder/ Cottonwood Riparian Forest
- 3 Alder/ Maple/ Redwood Riparian Forest
- 4 Herbaceous Riparian
- 5 Maple/ Tanoak/ Redwood Riparian Forest
- 6 Redwood Riparian Forest
- 7 Redwood/ Tanoak Riparian Forest
- 8 Willow/ Dogwood Riparian Forest
- 9 Willow Riparian Forest

## Non-Native/ Invasive Species

- A *Acacia* spp.
- B *Arundo donax*
- C *Cupressus macrocarpa*
- D *Cortaderia jubata*
- E *Cortaderia jubata* and *Acacia* sp.
- F *Deleiria odorata* & *Hedera helix*
- G *Eucalyptus* sp.
- H *Genista monspessulanus* & *Vinca major*
- I *Hedera helix*
- J *Robina psuedoacacia*
- K *Vinca major*

Scale is 1:24,000 or 1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Monterey Bay

Soquel Dr

Highway 1

Aptos Creek

San Lorenzo River

Salencia Creek

AC#6

AC#5

AC#4

AC#3

AC#1

AC#2

VC#6

VC#7

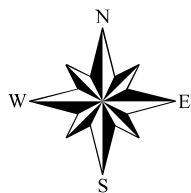


## Legend

— Roads and Highways

— Streams

• Sample Plots



## Vegetation Communities

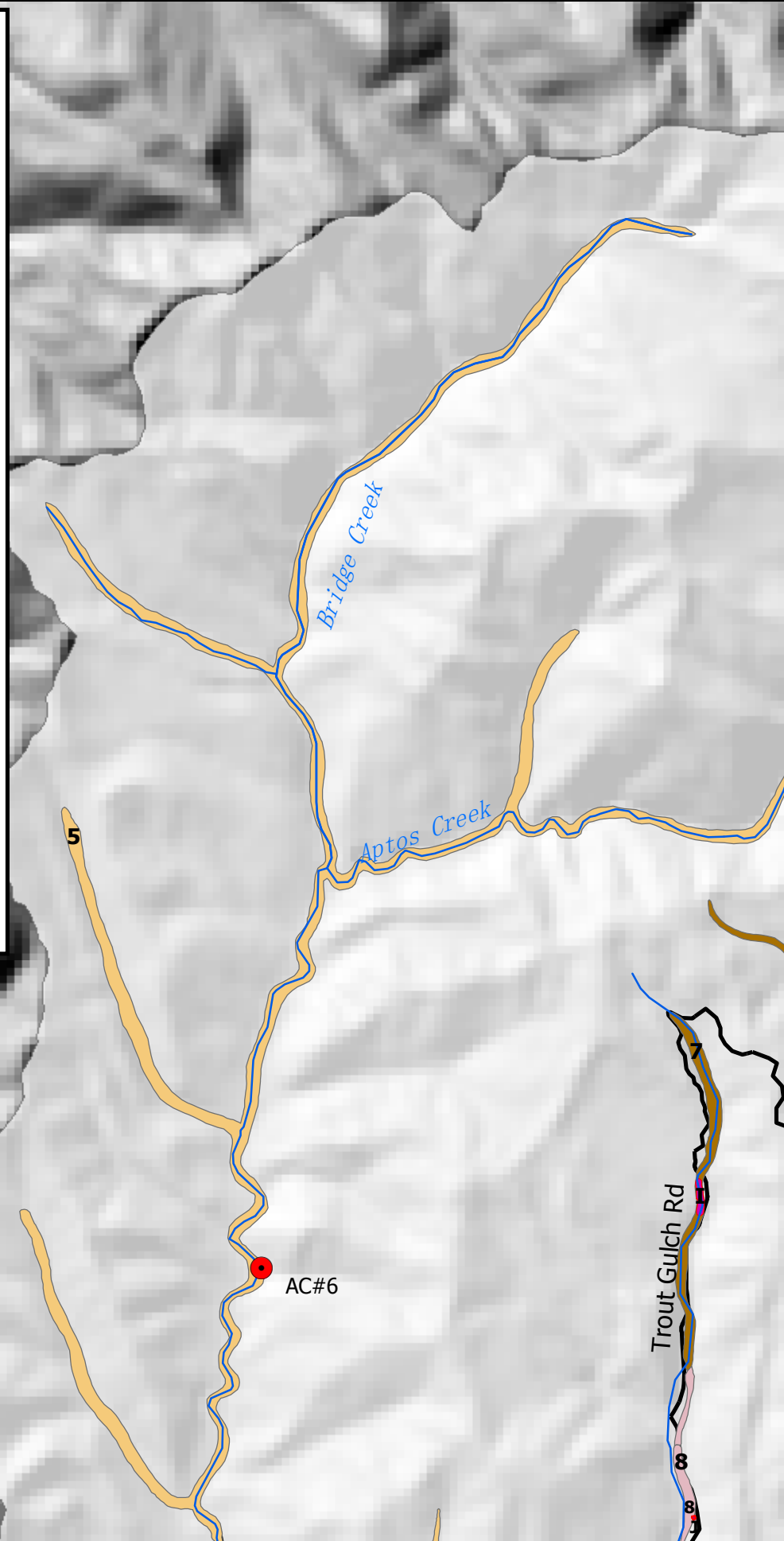
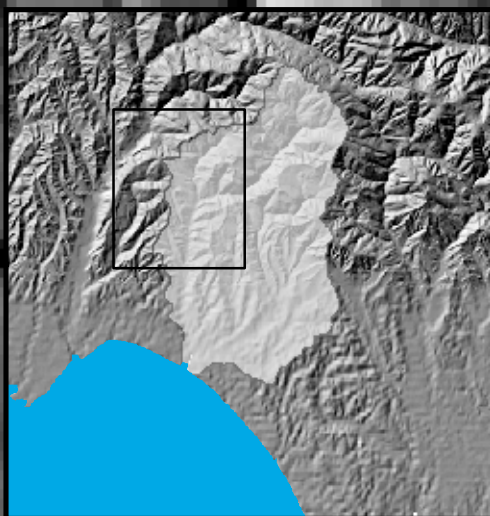
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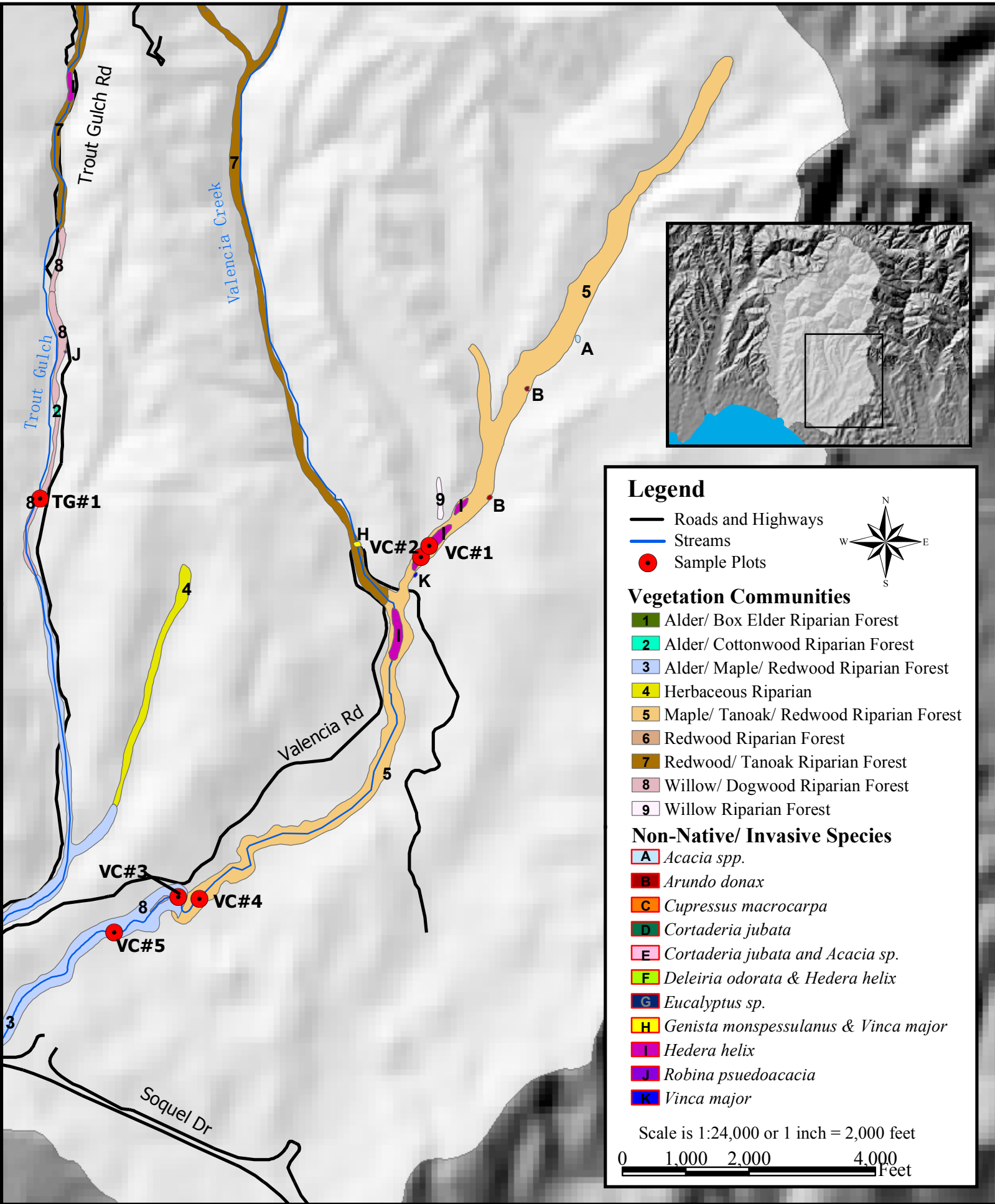
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0 1,000 2,000 4,000 Feet





## Legend

— Roads and Highways

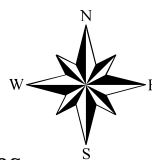
— Streams

• Sample Plots

## Vegetation Communities

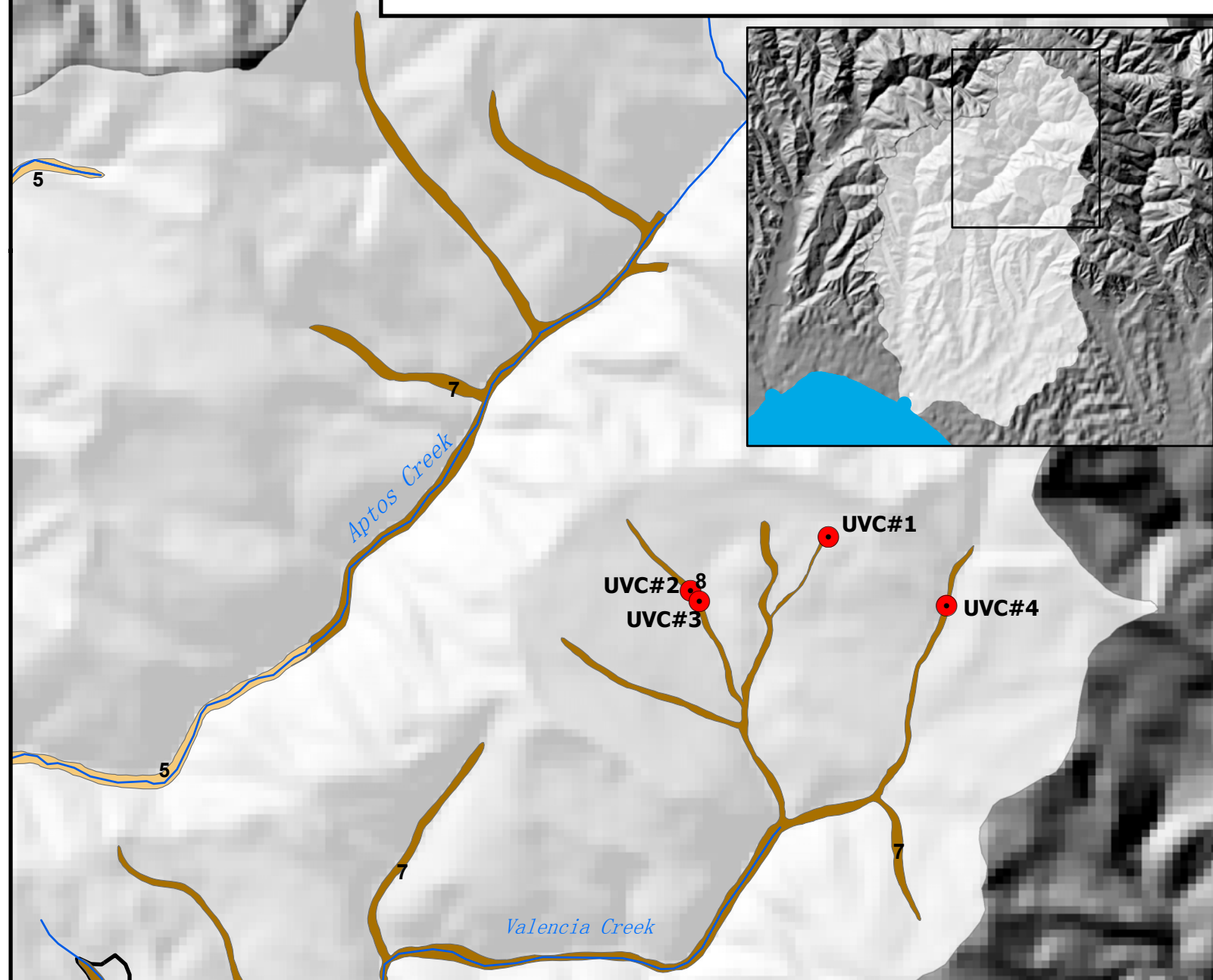
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- I *Hedera helix*
- J *Robina psuedoacacia*
- K *Vinca major*



**Table 1.2-1. Riparian plant community types identified within the Aptos Creek Watershed, continued.**

Plant Community Type	Common Plant Species	Creeks where Documented	Sample Plots*
Alder/Cottonwood/Redwood Riparian Forest	Red alder, black cottonwood, arroyo willow, redwood, pampas grass, Himalaya berry, panicled bulrush, English ivy, California blackberry, stinging nettle, thimbleberry	Aptos Creek Trout Gulch	AC-1, 2, 3
Willow/Dogwood Riparian Forest	Arroyo willow, yellow willow, creek dogwood, panicled bulrush, chain fern, hazelnut,	Trout Gulch Upper Valencia Creek	TG-1, UVC-2, VC-3
Herbaceous Riparian	Rabbitsfoot grass, rush, sedge	Tributary to Trout Gulch	None

\* UVC = Upper Valencia Creek; VC = Valencia Creek; TG = Trout Gulch; AC = Aptos Creek

### 1.3 Riparian Plant Community Descriptions

Riparian forests occur along almost all stream channels within the watershed. The streamside vegetation typically extends past the bank full flow line, as riparian trees reach to the groundwater. The stream channels usually exhibit some evidence of scour and/or deposition. The high water regime of a stream is an important component in the species composition along a watercourse, as most riparian plant species are adapted to colonizing recently disturbed (i.e., flooded, scoured or depositional areas) portions of a stream.

Within the Aptos Creek watershed, coast redwood is a common component of the riparian forest. The upper watershed lands, such as in the Fern Flat Road area, support a riparian community dominated by coast redwood (*Sequoia sempervirens*) and tanoak (*Lithocarpus densiflorus*). The Cox Road area is dominated by coast redwood, tanoak and big leaf maple (*Acer macrophyllum*). The riparian areas in the mid-portion of the watershed, such as near Trout Gulch Road and Aptos Creek Road, support red alder (*Alnus rubra*), box elder (*Acer negundo*), big leaf maple and coast redwood. The lower watershed on Aptos Creek supports another type of riparian woodland; this area supports red alder and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). Another type of riparian habitat is an herbaceous plant-dominated channel, as was observed along an intermittent tributary to Trout Gulch in the Baker Road area (see Figure 1.2-3).

The riparian forests in the watershed occur along both perennial and intermittent streams (depicted as a solid or dashed blue line on USGS 1:24,000 scale topographical maps) as well as some ephemeral streams with well-defined channels. Figures 1.2-1 through 1.2-4 display the occurrences of riparian plant communities based on the aerial photo mapping and reconnaissance surveys.

All riparian corridors are identified as “sensitive habitat” in Santa Cruz County Code.

#### 1.3.1 Redwood/Tanoak Riparian Forest

The redwood/tanoak riparian forest is prevalent in the upper watershed. The upper reaches of Trout Gulch and Valencia Creek and their tributaries are dominated by coast redwood and tanoak. In most areas, the riparian zone forms a narrow band along the channel and abuts upland redwood-forested lands. Mesic-loving herbaceous plants are present along the creek channel; the presence of these plants distinguishes the riparian zone from the adjacent upland redwood forest.

Within the redwood/tanoak riparian areas, the soil profile is well developed and rich in organic matter, with a thick layer of redwood duff. The tree canopy is dense (>80% cover), which creates an understory suitable for shade tolerant plants. Approximately 80% of the tree cover is provided by conifers (redwood) and 20% by



hardwoods (tanoak). Trees are dominated by mature, second growth redwoods, measuring 11-24" in diameter. Common riparian understory plants include snowberry (*Symphoricarpos* sp.), western raspberry (*Rubus leucodermis*), thimbleberry (*Rubus parviflorus*), sword fern (*Polystichum munitum*), chain fern (*Woodwardia fimbriata*) and redwood sorrel (*Oxalis oregana*). The understory includes both young and mature shrubs. Other species observed include wood rose (*Rosa gymnocarpa*), giant wake robin (*Trillium chloropetulum*), poison oak (*Toxicodendron diversilobum*), hedgenettle (*Stachys bullata*), red clintonia (*Clintonia andrewsiana*), California harebell (*Campanula prenanthoides*), and sneezeweed (*Selenium* sp.).

The occurrence of invasive, non-native plant species is limited within the redwood/tanoak riparian forests, presumably due to the dense shade. Based on the field surveys, the principal invasive plants are English ivy (*Hedera helix*) and periwinkle (*Vinca major*), two shade-tolerant species. These fast-growing perennial plant species thrive in the shady conditions and successfully compete with the native plants. Both the ivy and periwinkle are capable of growing into dense thickets, at the exclusion of the native plant species, thereby reducing plant diversity of the habitat. The ivy can also grow up the tree trunks, affecting the tree canopy habitat. The redwood/tanoak riparian forests within the watershed lands offer opportunities to remove and/or control the spread of these invasive pest plant species and allow natural revegetation of native understory species. A few occurrences of French broom (*Genista monspessulana*) were also observed in this forest type, typically in previously disturbed areas.

### **1.3.2 Maple/Tanoak/Redwood Riparian Forest**

The maple/tanoak/ redwood riparian forest is prevalent in the Aptos Creek watershed, occupying areas along Valencia Creek, Mangels Gulch, Aptos Creek and their tributaries. The riparian zone forms a band along the channel and abuts upland redwood and mixed evergreen-forested lands.

Within the maple/tanoak/ redwood riparian areas, the tree canopy is dense (>80% cover). Approximately 20% of the tree cover is provided by conifers (redwood) and 80% by hardwoods (maple and tanoak). Tree cover is provided by trees averaging 11-24" in diameter, with some larger trees (greater than 24") in Nisene Marks State Park). Shrub cover provides approximately 30% plant cover; the common shrubs species are thimbleberry, sword fern, lady fern (*Athyrium felix-femina*), chain fern, hazelnut (*Corylus cornuta*), and creek dogwood (*Cornus sericea*). The majority of the shrubs are mature. Herbaceous cover is prevalent; typical plant species include California blackberry, redwood sorrel, ginger (*Asarum caudatum*), slim Solomon's seal (*Smilicina stellata*), giant wake robin, fairy bells (*Disporum hookeri*), western raspberry, musk flower (*Mimulus moschatus*), coltsfoot (*Petasites frigidus* var. *palmatus*), and alum root (*Heuchera micrantha*). Other species observed include common horsetail (*Equisetum arvense*), water parsley (*Oenanthe sarmentosa*), five-finger fern (*Adiantum aleuticum*), wake robin (*Trillium ovatum*), and forget-me-not (*Myosotis latifolia*).

The occurrence of invasive, non-native plant species is limited to English ivy, periwinkle, and wandering Jew (*Tradescantia* sp.). These fast-growing perennial plant species thrive in the shady conditions and successfully compete with the native plants. Dense thickets of ivy and periwinkle were observed and in many areas, the ivy vines had grown up tree trunks and into the canopy. Many sediment bars supported young seedlings of English ivy during the summer 2002 surveys. These infestations should be removed and/or controlled to prevent their spread and allow natural revegetation of native understory species. Vines should be cut and/or pulled from tree trunks and tree canopies.

### **1.3.3 Alder/Maple/Redwood Riparian Forest**

The alder/maple/ redwood riparian forest is prevalent along perennial watercourses, occupying areas along the main stems of Trout Gulch and Valencia Creek. The riparian zone forms a band along the channel and abuts upland redwood, mixed evergreen-forested lands, orchards and residential areas.

Within the alder/ maple/ redwood riparian areas, the tree canopy is moderately dense (between 60 and 80% cover). Approximately 30% of the tree cover is provided by conifers (redwood) and 60% by hardwoods (alder and tanoak). Tree cover is provided by trees averaging 11-24" in diameter although young trees of dogwood are

also prevalent (less than 1" in diameter). Shrub cover provides approximately 10% plant cover; the common shrubs species are mature individuals of thimbleberry and dogwood. Herbaceous cover is slight; typical plant species include stinging nettle and hedgenettle. Associated species (providing less than 1% plant cover) include common horsetail, willow herb (*Epilobium ciliatum*), musk monkey flower, coltsfoot, wood fern (*Dryopteris arguta*), sword fern, nutgrass (*Cyperus eragrostis*), and sedge (*Carex densa*).

The occurrence of invasive, non-native plant species is limited to English ivy seedlings on exposed sediments and as patches in the woodland. These infestations should be removed and/or controlled to prevent their spread and allow natural revegetation of native understory species.

#### **1.3.4 Alder/Box Elder Riparian Forest**

The alder/box elder riparian forest is found at the lower end of Valencia Creek, just upstream of the confluence with Aptos Creek. Two large groves of this habitat type were documented in the watershed.

Within the alder/ box elder riparian areas, the tree canopy is moderately dense (approximately 90% cover). There are no conifers, so all tree cover is provided by hardwoods (red alder and box elder). Tree cover is provided by relatively young trees (averaging 6-11" in diameter), suggesting that the vegetation has established recently. Previous disturbances in this area may have occurred, resulting in this young riparian habitat. Shrub cover is low, approximately 5-10% presumably due to the dense tree cover; the common shrubs species are dogwood, California blackberry and yellow willow (*Salix lucida* ssp. *lasiandra*). Most of the shrubs are mature, except for young willow saplings along the creek channel. Herbaceous cover is approximately 40%; typical plant species include common horsetail, English ivy, musk monkey flower and lady fern. Associated plant species (less than 1% cover) include willow herb, coltsfoot, sword fern, stinging nettle, rabbitsfoot grass (*Polypogon monspeliensis*), wild cucumber (*Marah fabaceus*), and curly dock (*Rumex crispus*).

The occurrence of invasive, non-native plant species is limited to English ivy; the ivy is prevalent on the side banks of the creek and climbing up tree trunks and snags. These infestations should be removed and/or controlled to prevent their spread and allow natural revegetation of native understory species. Vines should be pulled and/or cut from the tree trunks and tree canopies.

#### **1.3.5 Alder/Cottonwood/Redwood Riparian Forest**

The alder/cottonwood riparian forest is found at the lower end of Aptos Creek, primarily downstream of Soquel Drive to Monterey Bay. Historically, this riparian woodland probably intergraded with a brackish water marsh habitat, however no marsh habitat remains in the lagoon area due to residential and commercial development of the area.

Within the alder/ cottonwood riparian areas, the tree canopy is moderately dense, however the creek channel is wide and total plant cover ranges between 40 to 90%. Approximately 5% of the tree cover is provided by conifers (redwood, Monterey cypress) and 95% by hardwoods (alder and cottonwood). The alders are relatively young (6-11" in diameter) whereas the cottonwoods are larger (greater than 24") and presumably older. Some of the alders likely established after the 1982 flood event. Shrub cover is approximately 30%; the common shrub species are arroyo willow (*Salix lasiolepis*), thimbleberry, pampas grass (*Cortaderia jubata*) and red dogwood. Herbaceous cover ranges between 30 and 50%; typical plant species are English ivy, panicled bulrush, stinging nettle, California blackberry, Mexican eupatorium (*Eupatorium adenophorum*) and giant scouring rush (*Equisetum hyemale*). Associated plant species (less than 1% cover) include willow herb, coltsfoot, common horsetail, bull thistle (*Cirsium vulgare*), periwinkle, wild cucumber, mugwort (*Artemisia douglasiana*), forget-me-not, rabbitsfoot grass, hellebore (*Epipactis helleborine*), Cape ivy (*Delairea odorata*), and garden nasturtium (*Tropaeolum majus*).

Invasive, non-native plant species are prevalent within the lower reaches of Aptos Creek. Occurrences of English ivy, periwinkle, Cape Ivy, acacia (*Acacia* sp.), pampas grass and Mexican eupatorium were observed. Hellebore is an invasive, non-native orchid. These infestations should be removed and/or controlled to

prevent their spread and allow natural revegetation of native understory species. The lower reaches of Aptos Creek also offer opportunities to re-establish a brackish water marsh.

### **1.3.6 Willow/Dogwood Riparian Forest**

The willow/dogwood riparian forest is found along Trout Gulch and Upper Valencia Creek. The presence of willows and dogwood is indicative of perennial water flow and/or high soil moisture during most times of the year. The vegetation is characterized by its dense, thicket-like growth. Other riparian tree species are absent due to previous or existing land uses, bank failures or erosion.

Within the willow/dogwood riparian areas, the tree canopy is moderately dense. Only 0-5% of the tree cover is provided by conifers (occasional redwood) and 95% (or more) by hardwoods (young yellow and arroyo willows and red dogwood, averaging 1" in diameter). Most tree cover is provided by trees less than 1" in diameter; some willows are between 6 and 11" in diameter. Shrub cover is approximately 40%; the common shrub species are young willows, young dogwood and chain fern. Herbaceous cover is relatively low due to the dense tree and shrub growth; typical plant species are redwood sorrel, sedge, common horsetail, and young seedlings of English ivy. Associated plant species (less than 1% cover) include gold back fern, sword fern, hazelnut, hedgenettle, water parsley, velvet grass (*Holcus lanatus*), California blackberry, California polypody (*Polypodium californicum*), western raspberry and forget-me-not.

Invasive, non-native plant species are limited to English ivy, occasional periwinkle thickets and scattered acacia (*Acacia* sp.) trees. The dominance of ivy (and lack of native woody plant cover) can also make the creek banks more susceptible to bank erosion. These infestations of non-native species should be removed and/or controlled to prevent their spread and allow natural revegetation of native understory species.

### **1.3.7 Herbaceous Riparian**

This riparian type occurs along some small tributaries in the watershed. These tributaries, such as a tributary to Trout Gulch along Baker Road, were observed to support herbaceous plant species. The plant species are a mixture of native and non-native species, including Italian ryegrass (*Lolium multiflorum*), bristly ox-tongue (*Picris echioides*), curly dock, creeping wild rye (*Leymus triticoides*), velvet grass, spreading rush (*Juncus patens*), nutgrass (*Cyperus* sp.), sedges (*Carex* spp.), common rush (*Juncus effusus*), Santa Barbara sedge (*Carex barbarae*) and brown-headed rush (*Juncus pynoccephalus*). The herbaceous areas typically occur in areas subject to animal grazing or other historic or current land uses where the woody riparian cover (usually willow and dogwood) has been browsed or otherwise removed.

As discussed under willow-cottonwood riparian woodland, many of the drainages currently supporting herbaceous riparian vegetation probably historically supported a woody riparian habitat. The watershed offers several opportunities for restoration of these areas through revegetation with willow-dogwood plants. There are also opportunities to remove occurrences of invasive, non-native plant species.

## **1.4 Sensitive, Rare And Endangered Botanical Resources**

### **1.4.1 Sensitive Plant Communities**

Sensitive habitats are defined by local, State, or Federal agencies as those habitats that support special status species, provide important habitat values for wildlife, represent areas of unusual or regionally restricted habitat types, and/or provide high biological diversity. All of the riparian plant communities within the Aptos Creek Watershed are designated as a high priority in the CNDDDB (CDFG, 2002). This category contains native plant communities that are regarded by CDFG as having special significance under the California Environmental Quality Act (CDFG, 1995a). Riparian habitats are also considered sensitive under County of Santa Cruz Code (Riparian Corridor and Wetlands Protection ordinance). This status is due to the value of these forests to wildlife and the relatively limited (and declining) distribution of this habitat at the local and

statewide level. These habitat types are considered areas of high biological quality, warranting preservation and management.

#### **1.4.2 Special Status Plant Species**

Most special status plant species within Santa Cruz County are restricted to specific habitats, such as grasslands, chaparral, coastal scrub or oak woodlands. Of the species known or having potential to occur within the Aptos Creek Watershed, none are known to occur in riparian habitats.

The special status plant species known or with potential to occur in the watershed are listed in Table 1.4-1. As depicted, none are expected within riparian habitats.

### **1.5 Invasive, Non-Native Plant Species and Pathogens**

#### **1.5.1 Invasive Non-Native Plant Species**

Several invasive non-native species have become established in the riparian areas of the watershed. Invasive, non-native plant species observed within the watershed and prioritized as to their threat to the riparian resources of the watershed include:

##### High Threat

- French broom (*Genista monspessulana*)
- Pampas grass (*Cortaderia jubata*)
- Periwinkle (*Vinca major*)
- Poison hemlock (*Conium maculatum*)
- Cape ivy (*Delaireia odorata*)
- English ivy (*Hedera helix*)
- Acacia (*Acacia* sp.)
- Giant Reed (*Arundo donax*)
- Black Locust (*Robinia pseudoacacia*)

##### Moderate to Low Threat

- Italian thistle (*Carduus pynnocephalus*)
- Monterey pine (*Pinus radiata*),
- Blue gum eucalyptus (*Eucalyptus globulus*),
- Harding grass (*Phalaris* spp.),
- Mexican eupatorium (*Eupatorium adenophorum*),
- Bull thistle (*Cirsium vulgare*)
- Himalaya berry (*Rubus procerus*),
- Wandering Jew (*Tradescantia* sp.)
- Forget-me-Not (*Myosotis latifolia*)

Other non-native plant species observed in the riparian areas include: hellebore and garden nasturtium; these two species occur in the riparian areas of the watershed but are not currently considered of management concern.

The riparian forests within the watershed lands offer opportunities to remove and/or control the spread of these invasive pest plant species and allow natural revegetation of native understory species.

#### **1.5.2 Pathogens**

A fungus responsible for Sudden Oak Death [SOD] is a water mold fungus in the genus *Phytophthora*. This fungus (*P. ramorum*) has been reported from northern Santa Cruz County and may occur in the watershed. Within the riparian areas, infestations may occur in tanoak trees, and possibly within redwoods (as a fungus-

**Table 1.4-1. List of special status plant species known, or with potential, to occur in the Aptos Creek Watershed, Santa Cruz County, California**

Species	CNPS	State Status	Federal Status	Habitat Preference Known Occurrence within Riparian Habitats within Watershed?
California bottlebrush grass ( <i>Elymus californicus</i> )	None	None	None	Oak Woodlands No
Hooker's manzanita ( <i>Arctostaphylos hookeri</i> )	List 1B	None	None	Sandy slopes, often intermixed with oak woodland No
Robust spineflower ( <i>Chorizanthe robusta</i> var. <i>robusta</i> )	List 1B	None	Endangered	Sandy slopes, often intermixed with oak woodland/maritime chaparral No
Monterey spineflower ( <i>Chorizanthe pungens</i> var. <i>pungens</i> )	List 1B	None	Endangered	Sandy slopes, often intermixed with oak woodland/maritime chaparral No
San Francisco wallflower ( <i>Erysimum franciscanum</i> )	List 4	None	Species of Special Concern	Sandy area, often near the coast No
San Francisco popcorn flower ( <i>Plagiobothrys diffusus</i> )	List 1B	Endangered	Species of Special Concern	Mesic grasslands No
Santa Cruz Clover ( <i>Trifolium buckwestiorum</i> )	List 1B	None	None	Mesic grasslands No
Santa Cruz tarplant ( <i>Holocarpha macradenia</i> )	List 1B	Endangered	Threatened	Grasslands, often on coast terrace deposits No
Kellogg's horkelia ( <i>Horkelia cuneata</i> ssp. <i>sericea</i> )	List 1B	None	Species of Special Concern	Oak woodland and edges of grasslands No
Small-leaved lomatium ( <i>Lomatium parviflorum</i> )	List 4	None	None	Oak Woodland No
Santa Cruz microseris ( <i>Microseris decipiens</i> )	List 4	None	Species of Special Concern	Grasslands, often on coastal terrace deposits No
Gairdner's yampah ( <i>Perideridia gairdneri</i> ssp. <i>gairdneri</i> )	List 4	None	Species of Special Concern	Grasslands, often on coastal terrace deposits No
Michael's piperia ( <i>Piperia michaelii</i> )	List 1B	None	Species of Special Concern	Grasslands, often on coastal terrace deposits No
Maple-leaved checkerbloom ( <i>Sidalcea malachroides</i> )	List 1B	None	None	Grasslands, often on coastal terrace deposits No
San Francisco campion ( <i>Silene verecunda</i> ssp. <i>verecunda</i> )	List 1B	None	Species of Special Concern	Grasslands, often on coastal terrace deposits No

**CNPS Status:**

**List 1B:** These plants (predominately endemic) are rare and currently vulnerable or have a high potential for vulnerability due to limited or threatened habitat, few individuals per population, or a limited number of populations. List 1B plants meet the definitions of Section 1901, Chapter 10 of the CDFG Code.

**List 4:** A watch list of plants with limited distribution in the state with low vulnerability and threat at this time. The plants are locally uncommon and should be monitored.



carrier). Live oaks (*Quercus* spp.), madrone (*Arbutus menziesii*) and other host species that grow in oak woodlands and mixed evergreen forests that abut the riparian corridors may also harbor this fungus. Although no trees were observed with obvious signs of SOD during the 2002 field surveys, it may occur in the riparian forests, particularly in the redwood/tanoak riparian forest in the upper watershed areas.

If SOD becomes prevalent within the watershed area in the future, significant areas of riparian woodland comprised of tan oak (i.e., redwood/tanoak riparian forest) would be susceptible to death. Opportunities exist in the watershed to inform property owners on measures to prevent/control the spread of this fungus. Homeowners should implement measures to prevent/control the spread of this fungus both on and off-site. Homeowners should be responsible for implementing the most current disease-preventing measures for the use, storage and/or transporting of oak firewood as a means of minimizing the spread of the disease with the County and the State of California. Preventative and treatment measures should also be implemented, as necessary. Current information on this disease and recommended treatments is available through the Sudden Oak Death website ([www.suddenoakdeath.org](http://www.suddenoakdeath.org)). Leaving infected downed trees within the riparian area is acceptable, however the transport of infected trees out of the watershed is discouraged.

## **1.6 Creek Descriptions**

### **1.6.1 Aptos Creek**

Aptos Creek travels through the residential and commercial developed areas in its lower reaches. In this floodplain area, the vegetation is comprised of an alder/cottonwood/redwood riparian forest (Figure 1.2-1). Urban land uses (i.e., roads, houses, commercial developments) abut the riparian woodland and, as such, the riparian corridor is relatively narrow. The woodland also supports several occurrences of invasive, non-native plant species and urban landscape plantings (i.e., calla lily, garden nasturtium). Invasive, non-native plants include pampas grass, acacia, English ivy, Cape ivy and eucalyptus. Western sycamores (*Platanus racemosa*), a native riparian tree, occur in the Soquel Drive area and intermix with the cottonwoods and alders.

In the upstream sections of Aptos Creek, the riparian woodland intergrades with the adjacent redwood and mixed evergreen forests. Redwoods are common along the creek, as are alder, tanoak and big leaf maple. Open areas also support willows. Native plants along the creek edge include coltsfoot, musk flower and lady fern; redwood sorrel is prevalent in the shady redwood areas. In-stream sediment deposits within the creek support sedges, musk flower and water smartweed. Bedrock outcrops support California polypody (*Polypodium californicum*), five-finger fern and alum root.

### **1.6.2 Bridge Creek**

This tributary to Aptos Creek is dominated by redwood and tanoak (Figure 1.2-2). Western raspberry, thimbleberry, sword fern, and redwood sorrel are common understory plant species. Only limited field reconnaissance was conducted in this area.

### **1.6.3 Trout Gulch**

The lower reaches of Trout Gulch are similar to the mid-portion of Aptos Creek; the riparian forest is dominated by alder, big leaf maple and redwood (Figure 1.2-1). Bedrock formations are present along the main stem and tributaries; these bedrock areas support five finger fern, sugar scoop (*Tiarella unifoliata*), and wandering Jew. Open areas also support hedgenettle, coffee berry (*Rhamnus californica*) and hazelnut.

Upstream reaches of Trout Gulch support distinct patches of willow and dogwood (i.e., in Larson Road area) (Figure 1.2-2). Associated plant species include wandering Jew, lady fern, stinging nettle, panicled bulrush and Santa Barbara sedge (*Carex barbara*). There are also occurrences of Cape ivy, calla lily and periwinkle. English ivy and periwinkle are prevalent upstream to Piate Valley. The upstream reaches are dominated by redwood and tanoak, with thimbleberry being the common understory shrub. Some pampas grass grows along the road, near the creek.

The smaller upper watershed tributaries are dominated by redwood and tanoak. Western raspberry, thimbleberry, sword fern, and redwood sorrel are common understory plant species in these areas.

#### **1.6.4 Valencia Creek**

Valencia Creek is dominated by tanoak/redwood riparian forest in the upper reaches (Figures 1.2-3 and 1.2-4). The lower reach, near its confluence with Aptos Creek supports an alder/box elder riparian forest.

In the Cox Road area of Valencia Creek, the riparian woodland intergrades with the adjacent redwood and mixed evergreen forest. Redwoods are common along the creek, as is tanoak and big leaf maple. Open areas also support willows and dogwood. Native plants along the creek edge include coltsfoot, musk flower and lady fern; redwood sorrel is prevalent in the shady redwood areas. In-stream sediment deposits within the creek support sedges, musk flower, water smartweed and young English ivy seedlings. Areas with partial shade, such as near the Polo Grounds County Park, include hazelnut and flowering currant (*Ribes californicum*). Some eroded creek banks were also evident; these areas have been partially revegetated with young willow and young alder; invasive, non-native pampas grass, French broom and bull thistle have also colonized these disturbed areas. Creek areas with bedrock outcrops support five-finger ferns.

Two large patches of alder/box elder riparian forest occurs along Valencia Creek, just upstream of the creek's confluence with Aptos Creek. These areas are dominated by these two deciduous tree species, in contrast to the redwood-dominated upstream reaches. The relatively small size of the trees in this area suggests that this forest is relatively young. The alders and willows may have colonized previously disturbed areas or on accumulated sediment deposits after major storm events.

Occurrences of invasive, non-native plant species occur adjacent to residential areas, at creek bank failures and at other erosion sites. Patches of giant reed (*Arundo donax*) were observed between Valencia Creek and Cox Road. Young acacia trees were also noted at these erosion sites. English ivy is also prevalent; in some areas, the ivy forms dense thickets on the tree trunks and in the tree canopy. Isolated groves of non-native locust (*Robinia* sp.) and acacia were noted in the Cherokee Lane area. Occurrences of French broom are limited to scattered occurrences, such as near Highway 1. Wandering Jew, a non-native plant species, was observed on in-stream sediment deposits near Cox Road, intermixed with periwinkle. These two species out compete with the native groundcovers, such as redwood sorrel, reducing the native plant diversity of the riparian habitat. The lack of native woody plant cover can also make the creek banks more susceptible to bank erosion.

#### **1.6.5 Mangels Gulch**

This tributary to Aptos Creek is dominated by redwood and tanoak. Only limited field reconnaissance was conducted in this area (Figure 1.2-1).

**APPENDIX A**  
**SAMPLE PLOT PHOTOS AND SUMMARY OF DATA**

## PHOTOGRAPHS OF RIPARIAN VEGETATION SAMPLE PLOTS



Plot VC-1. Maple/Tanoak/Redwood Series along Valencia Creek; accessed from Cox Road.



Plot VC-2. Maple/Tanoak/Redwood Series along Valencia Creek, accessed from Cox Road.



Plot VC-3. Willow/Alder Series along Valencia Creek; assessed from Polo Grounds County Park; early succession stage of alder/maple/redwood series due to bank erosion.

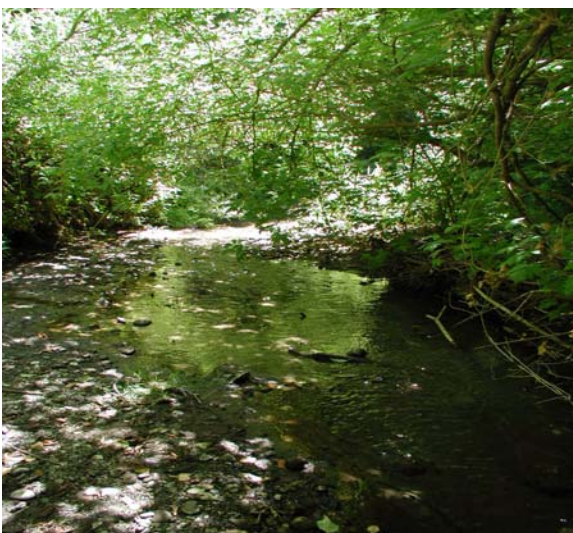




Plot VC-4. Maple/Tanoak/Redwood Series along Valencia Creek; accessed from Polo Grounds County Park.



Plot VC-5. Alder/Maple/Redwood Series along Valencia Creek; accessed from Polo Grounds County Park.



Plot VC-6. Alder/Box Elder Series along Valencia Creek; accessed from Valencia School.





Plot UVC-1. Redwood/Tanoak Series on  
Tributary to West Branch of Valencia  
Creek; assessed from Fern Flat Road.



Plot UVC-2. Willow/ Dogwood Series on  
middle branch of West Fork of Valencia  
Creek; assessed from Fern Flat Road.



Plot UVC-3. Redwood/Tanoak Series on Middle Branch of Valencia Creek; accessed from Fern Flat Road.



Plot UVC-4. Redwood/Tanoak Series on Valencia Creek; accessed from end of Fern Flat Road.





Plot TG-1. Willow/Dogwood Series along Trout Gulch; accessed from Trout Gulch Road.



Plot AC-1. Alder/Cottonwood/Redwood Series along Aptos Creek; accessed from Spreckels Avenue.



Plot AC-2. Alder/ Cottonwood/Redwood Series along Aptos Creek; accessed from Spreckels Avenue.



Plot AC-3. Alder/Cottonwood/Redwood Series along Aptos Creek; accessed from Aptos Creek County Park.



Plot AC-4. Maple/Tanoak/Redwood Series along Aptos Creek; accessed from George's Picnic Area, Forest of Nisene Marks State Park.



Plot AC-5. Maple/Tanoak/Redwood Series along Aptos Creek; accessed from Porter Family Picnic Area, Forest of Nisene Marks State Park.

## Summary Data from Riparian Assessment Data

(Data Sheets are available in hard copy from Coastal Watershed Council)

Sample Plot	Creek	Dominant Plant Species	Average Tree Diameter	% Cover Conifer/Hardwood Trees	Shrub Cover (%)	Herbaceous Cover (%)
VC-1	Valencia Creek	Maple, tanoak, redwood	11-24"	20/80	30	50
VC-2	Valencia Creek	Maple, tanoak, redwood	>24"	30/50	60	30
VC-3	Valencia Creek	Willow, alder	<1"	0/40	10	20
VC-4	Valencia Creek	Maple, tanoak, redwood	11-24"	10/90	50	30
VC-5	Valencia Creek	Alder, maple, redwood	11-24"	30/60	10	20
VC-6	Valencia Creek	Alder, box elder	6-11"	0/55	50	40
VC-7	Valencia Creek	Alder, box elder	6-11"	0/60	30	30
UVC-1	Upper Valencia Creek	Redwood, tanoak	11-24"	80/20	40	60
UVC-2	Upper Valencia Creek	Willow/dogwood	6-11"	10/75	40	90
UVC-3	Upper Valencia Creek	Redwood, tanoak	11-24"	85/15	30	40
UVC-4	Upper Valencia Creek	Redwood. Tanoak	11-24"	95/5	10	20
AC-1	Aptos Creek	Alder, redwood	11-24"	5/95	50	30
AC-2	Aptos Creek	Alder, cottonwood	6-11"	5/95	5	30
AC-3	Aptos Creek	Alder, cottonwood, redwood	6-11"	10/90	50	50
AC-4	Aptos Creek	Maple, tanoak, redwood	11-24"	60/40	55	30
AC-5	Aptos Creek	Maple, redwood, tanoak	11-24"	60/40	10	30
AC-6	Aptos Creek	Alder, maple, redwood	6-11"	30/60	10	20
TG-1	Trout Gulch	Willow, dogwood	6-11"	0/100	10	10



**APPENDIX B**

**GUIDELINES FOR RIPARIAN REVEGETATION  
AND  
REMOVAL OF INVASIVE, NON-NATIVE SPECIES**

# APTOS CREEK WATERSHED ASSESSMENT AND ENHANCEMENT PLAN

## APPENDIX B GUIDELINES FOR RIPARIAN REVEGETATION AND REMOVAL OF INVASIVE, NON-NATIVE SPECIES

### 1.0 INTRODUCTION

A goal for the enhancement component of the plan is to manage the native riparian habitats so they provide suitable and sustainable habitat for native plant and animal species. A second goal is to remove and control occurrences of invasive, non-native plant species.

### 2.0 PLANT MATERIALS

Plant materials used for riparian revegetation should use locally obtained native plants for the revegetation. Table B-1 provides a list of suitable plant species for riparian revegetation within the Aptos Creek Watershed. Several local sources can provide locally native plant materials. Some species, such as willow, cottonwood and dogwood, can be obtained as live cuttings. These plants can be installed as dormant cuttings.

#### 2.1 Sources of Container Stock Plants

Local nurseries and growers supply native riparian and wetland plant species. These sources are also available to collect and propagate plant material from a local area. Some available sources include:

CENTRAL COAST WILDS  
Santa Cruz, CA  
(831) 459-0656

NATIVE REVIVAL NURSERY  
Aptos, CA  
(831) 684-1811

ELKHORN NATIVE PLANT NURSERY  
Moss Landing, CA  
(831) 763-1207

**Table B-1. Primary Plant Species Suitable for Riparian Revegetation in the Aptos Creek Watershed**

Common Name	Scientific Name	Typical Spacing (feet, on center)	Recommended Application
<b>Trees</b>			
Willow	<i>Salix</i> spp.	10 feet	Dormant Cutting
Black Cottonwood	<i>Populus balsamifera</i> ssp. <i>tricocarpa</i> .	10 feet	Dormant Cutting
Box Elder	<i>Acer negundo</i>	15-20 feet	Tree pot or one gallon
Big leaf Maple	<i>Acer macrophyllum</i>	15-20 feet	Tree pot or one gallon
Red Alder	<i>Alnus rubra</i>	15-20 feet	Tree pot or one gallon

Common Name	Scientific Name	Typical Spacing (feet, on center)	Recommended Application
<b>Trees</b>			
Coast Redwood	<i>Sequoia sempervirens</i>	15-20 feet	Tree pot or one gallon
Red Dogwood	<i>Cornus sericea</i>	15-20 feet	Tree pot, one gallon or cutting
<b>Shrubs and Groundcovers</b>			
Hazel nut	<i>Corylus cornuta</i>	15-20 feet	Tree pot or one gallon
California rose	<i>Rosa californica</i>	6 feet	Dee Pot
Wood rose	<i>Rosa gymnocarpa</i>	6 feet	Dee Pot
Blue blossom	<i>Ceanothus thyrsiflorus</i>	6 feet	Dee Pot
Coffee berry	<i>Rhamnus californica</i>	6 feet	Dee Pot
Flowering Currant	<i>Ribes californicum</i>	6 feet	Dee Pot
Western Raspberry	<i>Rubus leucodermis</i>	6 feet	Rooted Cutting or Dee Pot
Thimbleberry	<i>Rubus parviflorus</i>	6 feet	Dee Pot
California blackberry	<i>Rubus ursinus</i>	6 feet	Rooted Cutting or Dee Pot
Bracken Fern	<i>Pteridium aquilinum</i>	6 feet	Root Division or Dee Pot
Wood fern	<i>Dryopteris arguta</i>	6 feet	One gallon
Mugwort	<i>Artemisia californica</i>	6 feet	One gallon
Mule Fat	<i>Baccharis salicifolius</i>	10 feet	Dormant Cutting
Purple needlegrass	<i>Nassella pulchra</i>	3 feet	Plugs of seed
Blue Wild Rye	<i>Elymus glaucus</i>	3 feet	Plugs of seed
California Brome	<i>Bromus carinatus</i>	3 feet	Plugs of seed
Common Yarrow	<i>Achillea millefolium</i>	N/A	Seed
Meadow Barley	<i>Hordeum brachyantherum</i>	3 feet	Plugs of seed
California Oatgrass	<i>Danthonia californica</i>	3 feet	Plug
Sword fern	<i>Polystichum munitum</i>	6 feet	Root Division or Dee Pot
Chain fern	<i>Woodwardia fimbriata</i>	6 feet	One gallon
Redwood Sorrel	<i>Oxalis oregona</i>	3 feet	One gallon

\* Note: Meadow barley is suitable for moist and seasonally wet areas.

## 2.2 Sources of Seed for Erosion Control and Revegetation

Regional and local nurseries and growers can supply native seed for erosion control and revegetation. These sources are also available to collect native seed from a local area. Some available sources include:

PACIFIC COAST SEED  
(925) 373-4417  
CENTRAL COAST WILDS  
(831) 459-065  
ELKHORN NATIVE PLANT NURSERY  
(831) 763-1207

## 3.0 REVEGETATION TECHNIQUES

### 3.1 Planting Locations

Most riparian plant species are adapted to growing in distinct zones along a creek channel. Some species, such as willow, cottonwood, box elder, alder and mulefat, typically grow along the toe of the channel and

along the lower-mid bank. Plant species tolerant of drier conditions, such as coast redwood, big leaf maple, and tanoak are more appropriately planted along the upper slope.

Refer to Table B-1 for a listing of the primary plant species suitable for revegetation within riparian habitats in the watershed. It should be noted, however, that other plant species that occur in these habitats may also be suitable.

### **3.2 Revegetation Techniques and Guidelines**

Planting of container stock and live cuttings (i.e., willow, dogwood and cottonwood pole stakes) should occur in the fall months after rain has moistened the ground to a minimum depth of eight inches and more rain is in the forecast (typically November through January). Once the planting stock is delivered to the revegetation site, they can be installed, as described below and depicted on the plant installation detail (Figure B-1).

Plants should be installed by excavating a planting hole large enough to receive the rootball. All planting holes should be backfilled with native soil and tamped. Plantings should be watered such that the root crown is even with the surrounding grade. A three-inch high hand-packed soil berm should be constructed around the plant (or just along the down slope edge for creek bank plantings) to create a watering basin. If soil is not moist to 14 inches from natural rainfall, the plant should be hand-watered immediately following installation. After planting is complete, shredded mulch should be spread in the planting basin, as shown on Figure B-1.

For many areas, a foliage browse protector (metal cage) for deer and rabbit browsing may also be necessary.

Willows, cottonwoods and dogwood can be installed by live cuttings, as depicted on Figure B-2.

### **3.3 Irrigation of Installed Plants**

Plants, when installed as container stock (i.e., one-gallon pots, or other sizes), will require supplemental irrigation for the first two-three years after installation. In some areas of the watershed, such as residences, the revegetation areas can be served by a drip-type irrigation system. In less-accessible areas, the plants may need a temporary water tank that provides gravity feeding or the plants should be hand-watered.

Supplemental watering should be implemented for container stock plantings no less than three times a month during June, July, August and September of the first two years after planting. Approximately five gallons of water should be applied to each container stock planting during each watering event. Each watering should be of such a quantity as to provide optimum growth conditions. If drought stress is noted on any of the plantings, the quantity and interval of watering should be increased.

If an unusual drought occurs in other months (i.e., less than 70 percent of normal rainfall between October and May) such that soil moisture drops to a level where plant survival is compromised, supplemental irrigation should be initiated. Supplemental irrigation should be continued until natural rainfall levels replenish soil moisture.

### **3.4 Erosion Control Seeding Techniques and Guidelines**

Fore areas needing erosion control seeding, seeding should include native grasses and forbs. A suggested seeding list is depicted on Table B-2.



**Table G-2. Recommended Seeding List for Erosion Control**

COMMON NAME	Scientific Name	Typical Application Rate (lbs./acre)
Purple Needlegrass	<i>Nassella pulchra</i>	10
Blue Wild rye	<i>Elymus glaucus</i>	10
California Brome	<i>Bromus carinatus</i>	10
Meadow Barley *	<i>Hordeum brachyantherum</i>	10
EnviroFiber	100% Wood or Paper Fiber	2000
Mulch Tackifier	M-binder	100
Mycorhizal inoculant	Am-120	-----
Clean Straw	Rice or Barley Straw	4,000

Note: Meadow barley is suitable for moist and seasonally wet areas.

Prior to seeding, the area should be raked clean of vegetation and the soil surface should be scarified with a rake (small areas) or heavy equipment (large areas). Seeding should occur in late fall or early winter, in order to coincide with the natural rainfall period. However, supplemental seeding can be accomplished earlier in the fall if overhead irrigation is provided. In this case, the area should be overhead irrigated for approximately one hour in order to moisten the top half-inch of soil.

If seed is hand broadcast, the seed should be lightly raked in order to cover the seed with a quarter inch of soil (refer to Table B-2 for seeding rate). The seedbed should be kept evenly moist until the seeds germinate or until a steady natural rainfall pattern develops.

If the site is to be hydroseeded, a 3-step hydroseeding process, applied by a professional hydroseeder is recommended. Seed, fertilizer, mulch, and tackifier will be sown at the rate specified on the plans. Prior to hydroseeding, the seed mixture will be pre-mixed by a mechanical mixer. Prior to the application of the hydroseed/mulch mixture, the applicator will clean and rinse all equipment to preclude the application of weeds or other species not intended for the site. The hydroseeding application will follow a three-step process: 1) Hydro-spray seed, fertilizer, fiber mulch, tackifier and mycorhizal inoculant, 2) application of clean straw, and 3) fiber mulch and tackifier.

#### **4.0 Removal and Control of Invasive, Non-native Plant Species**

Table B-3 lists the invasive, non-native plant species that were observed within the watershed and should be removed/controlled. These plants can be eradicated by hand or mechanical methods, as described below. Removal should include the entire plant including the roots that are subject to re-rooting (see descriptions of specific methods, below), except for the roots of eucalyptus, acacia and pine trees.

**Table B-3. Invasive, Non-Native Plant Species Recommended for Removal/Control within Riparian Areas, Aptos Creek Watershed**

Common Name	Scientific Name
<b>Trees</b>	
Acacia (all types)	<i>Acacia</i> spp.
Eucalyptus (all types)	<i>Eucalyptus</i> spp.
Tree-of-Heaven	<i>Ailanthus altissima</i>

**Table B-3. Invasive, Non-Native Plant Species Recommended for Removal/Control within Riparian Areas, Aptos Creek Watershed (continued).**

Common Name	Scientific Name
<b>Shrubs</b>	
French Broom	<i>Genista monspessulana</i>
Scotch Broom	<i>Cytisus scoparius</i>
Spanish Broom	<i>Spartium junceum</i>
<b>Other Perennials and Annuals</b>	
Periwinkle	<i>Vinca major</i> and <i>Vinca minor</i>
English ivy and Algerian Ivy	<i>Hedera helix</i> and <i>Hedera</i> sp
Cape ivy	<i>Delaireia odorata</i>
Pampas grass	<i>Cortaderia selloana</i> and <i>C. jubata</i>
Mexican Eupatorium (or Sticky Ageratina)	<i>Eupatorium (or Ageratina) adenophorum</i>
Poison Hemlock	<i>Conium maculatum</i>
Bull Thistle and other thistles	<i>Cirsium vulgare</i>
Giant Reed	<i>Arundo donax</i>

#### 4.1 Poison Hemlock

Poison hemlock is a non-native biennial species, with a long taproot. This plant species is fast growing and rapidly colonizes disturbed soils. Due to the invasive and aggressive growth of the poison hemlock, it is necessary to control this species to ensure successful enhancement or revegetation of the riparian woodland and wetland areas. Recommended control measures include seasonal mowing, hoeing and/or hand pulling. If the plant is hoed, the plant should be removed a minimum of two inches below the ground surface, before flowering. All plant parts contain poisonous alkaloids; workers should wear gloves when handling the plant.

#### 4.2 Periwinkle

This plant (also known by its Genus name of *Vinca*) is a fast-growing, perennial species. This plant grows by underground runners and is most common in the lower watershed areas. Due to the invasive and aggressive growth of this plant species and its ability to choke out all other understory plants, it is necessary to control this species to ensure successful restoration of native riparian and wetland areas. For small infestations that contain some native plant growth, the vines can be removed by hand, although repeated efforts will be necessary to eliminate the species from a site. For a large infestation with little native plant cover, the currently recommended method of control is to hand grub the ground to remove all above-ground plants as well as underground runners. The grubbed areas should be seeded with native perennial grasses to provide erosion control. Due to the persistence of this species, repeated efforts will be required to remove above and below ground plant parts. Once the infestation has been significantly decreased, the site should be revegetated with native riparian shrubs and trees.

#### 4.3 English Ivy, Cape Ivy and Algerian Ivy

These species are very fast growing and perennial ivy's. These plants grow by underground runners and, currently are found along all creeks in the watershed, primarily near the urban and rural-developed areas. Due to the invasive and aggressive growth of these plant species, their ability to choke out all other understory plants, and climb up tree trunks into the overstory, it is necessary to control this species. For small infestations that contain some native plant growth, the vines can be removed by hand, although repeated efforts will be necessary to eliminate the species from a site. For a large infestation with little native plant cover, the recommended method of control is to hand grub the ground to remove all above-ground plants as well as underground runners. The grubbed areas should be seeded with native perennial grasses to provide

erosion control. Due to the persistence of this species, repeated efforts will be required to remove above and below ground plant parts.

#### **4.4 Acacia**

Acacias are medium-sized trees in the Pea Family. There are several types of acacia; most commonly observed are blackwood and green wattle acacia. The tree is fast growing and reproduces through root suckers and by seed. Control measures for the site include cutting the trees and/or root sprouts flush with the ground surface. As stump sprouting often occurs, apply a topical application of an herbicide (e.g., Round-up or Garlon) to the cut stumps. Young tree sprouts can be hand-pulled. All felled trees and associated plant material, particularly mature seed heads, should be removed from the site.

#### **4.5 Eucalyptus**

The majority of eucalyptus trees within the watershed are blue gum eucalyptus. The tree is fast growing and reproduces through trunk sprouts and by seed. Control measures for the site include cutting the trees and/or trunk sprouts flush with the ground surface and the immediate topical application of an herbicide (e.g., Round-up or Garlon at full strength) to the cut stumps. Re-application may be necessary for large stumps with substantial root mass. Young seedlings can be hand-pulled. All felled trees and associated plant material, particularly bark peels and mature seed heads, should be removed from the site.

#### **4.6 French Broom, Scotch Broom and Spanish Broom**

These brooms occur in previously disturbed areas. All three species reproduce primarily by seed, although vegetative reproduction and stump sprouting also occur. Seeds are thought to be viable for 50-80 years. Control measures for the site include hand pulling of all plants in winter when soil moisture is highest. A weed wrench may be needed to remove the larger individuals. Cutting, mowing or weed-whacking broom plants are not recommended. Soil disturbance should be minimized since bare soil fosters broom seed germination. All pulled plant material, particularly plants with flowers and seeds, should be removed from the site.

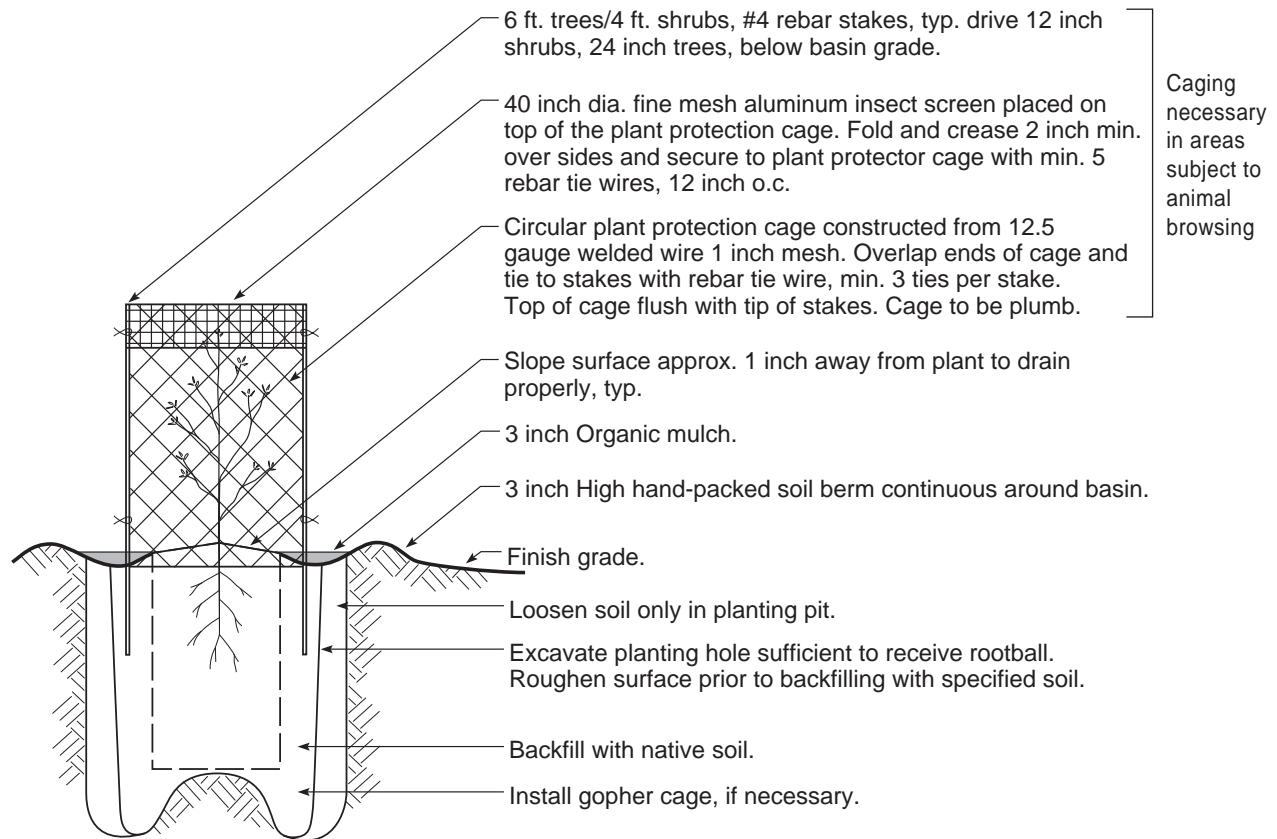
#### **4.7 Pampas Grass**

This non-native perennial grass is well known by its large tussock of leaves and tall white-cream flowering plumes. Reproduction is mainly by seed and seedlings can germinate in a variety of soil types. Pampas grass is highly invasive, especially in the coastal fog belt where freezing temperatures do not occur. Well-established plants should be removed implementing the following measures:

- Remove all flowering plumes prior to opening (before July) and place flower plumes into sturdy bags to prevent seed release.
- Chop the leaf clumps with a Pulaski and shovel; entire crown should be removed so that crown sprouting is prevented. A chain saw or weed eater with a rotary blade can be used to remove leaves in order to reach the base of the crown.
- All plant parts, including the root crown, should be removed from the site.
- The crown can be cut in quarters and removed; the crown should be turned up side down to expose the roots to the air.
- Workers should wear gloves, long sleeves and long pants as the leaves can cut skin.

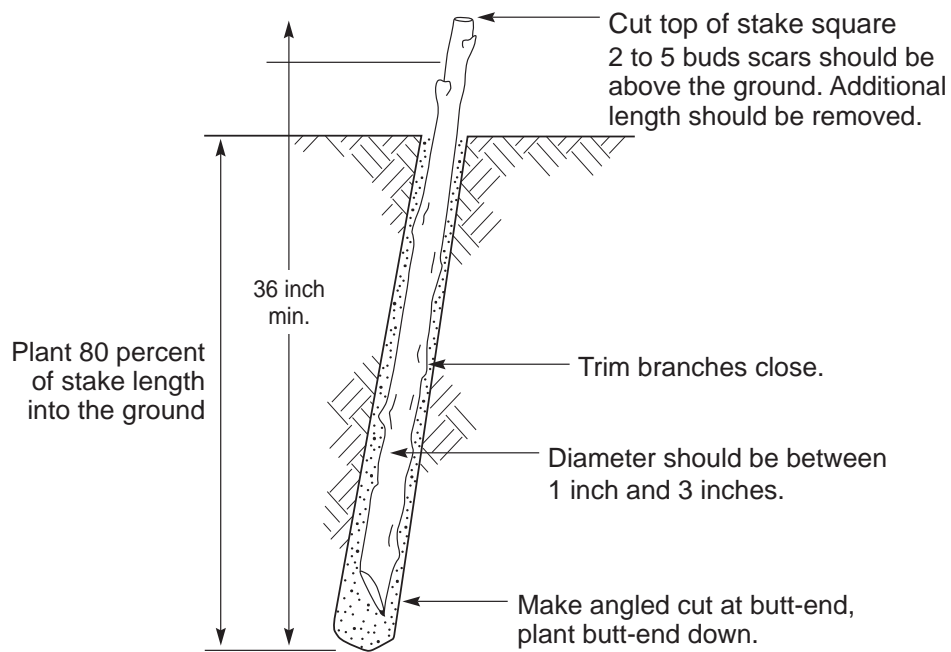
#### **4.8 Bull Thistle and Other Thistles**

Most thistles are biennial herbs. They are characterized by thistle-like pink flowers and spiny leaves. Thistles reproduce by seed; the seed is wind-dispersed. Control measures include hoeing or hand pulling. If the plant is hoed, the plant should be removed a minimum of two inches below the ground surface, before flowering. All removed plant material, including immature flowers, should be removed from the site.

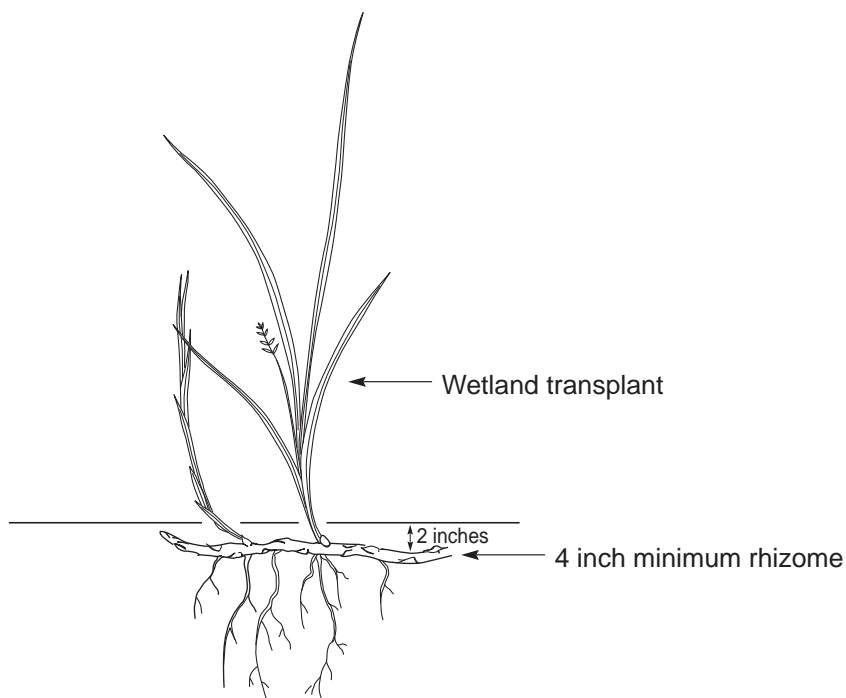


Source: Biotic Resources Group, 2001





LIVE CUTTING



WETLAND TRANSPLANT

Source: Biotic Resources Group, 2001